Lesser Wanderer (*Danaus petilia*)
on *Gomphocarpus fruticosus*

METAMORPHOSIS

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A quarterly meeting is scheduled in order to plan club activities and the magazine. See BOIC Programme.

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Membership fees are $30 for individuals, schools, and organizations.

Aims of the Organization

- To establish a network of people growing butterfly host plants;
- To hold information meetings about invertebrates;
- To organize excursions around the theme of invertebrates e.g. butterflies, native bees, ants, dragonflies, beetles, freshwater habitats, and others;
- To promote the conservation of the invertebrate habitat;
- To promote the keeping of invertebrates as alternative pets;
- To promote research into invertebrates;
- To encourage the construction of invertebrate friendly habitats in urban areas.

Magazine Deadlines

If you wish to submit an item for publication the following deadlines apply:
March issue – February 1st June issue – May 1st
September issue – August 1st December issue – November 1st
All articles should be submitted directly to the Editor daphne.bowden1@bigpond.com

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Cover Painting

Lesser Wanderer (*Danaus petilia*) on *Gomphocarpus fruticosus*
Painting by Michael Hutchison

FROM THE PRESIDENT

It must always be stressed that we are deeply indebted to the various contributors of articles for this magazine. I start with Michael Hutchison and his beautiful painting for our cover and end with Trevor Lambkin's solution to our mystery image taken "Under the microscope". Please send in your contribution or idea – nothing will be deemed too small and it is unlikely that it will also be deemed too large!

Over the past year we have been developing the concepts of a competition or challenge to be offered to young people as a means of stimulating interest in invertebrates by younger generations. This has progressed to the stage where, with the wonderful cooperation of the staff of the Toohey Forest Environmental Education Centre (TFEEC), details of the competition will be emailed out to quite a number of high schools in April. We have decided to provide quite generous prizes while the response is, of course, as yet unknown. Our deep thanks are given to the TFEEC staff for their great support.

On studying Lois and Erica's photo essay "A Tree of Life" and having participated in the recent aquatic survey as reported by Alisha, I am reminded of a major goal of the club which is concern for the maintenance and the restoration of habitats. The thousands of invertebrate species that usually go about their business unobserved rely on these habitats to play their parts in our wonderful inheritance of living biodiversity.

Best wishes, *Ross*

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Focus on the Lesser Wanderer butterfly, *Danaus petilia* (Stoll 1790) (Lepidoptera: Danainae): its name, origins, distribution, hosts, congeners and mimics – Part one – *John T. Moss*

The butterfly until recently known as *Danaus chrysippus petilia* is part of a (closely related) species group widespread throughout Afro-Asia, Australia, Papua-New Guinea and some Pacific islands, as well as an occasional vagrant to New Zealand.

In 1758, Linnaeus named an Afro/Asian butterfly *Papilio chrysippus* - the specimens were from Canton in China. Some African ones have been known as "African Queen", while the name "Plain Tiger" has been applied to the Indo-Malayan-Thai form (Corbett & Pendlebury, 1992). The Australian ones have been known as the "Lesser Wanderer" - but only since the arrival and establishment of the North American Monarch butterfly (*Danaus plexippus*), which itself became known locally as the "Wanderer".

The author of *D. petilia* was a Dutch lepidopterist named Caspar Stoll who originally named it *Papilio petilia* in 1790 but probably **not** from specimens from Australia, as the east coast of what was then New Holland had only recently been discovered and there was no specimen in the small butterfly collection of Joseph Banks. Also the First Fleet had only just arrived two years earlier and it is unlikely anything could have been transported back to Europe in such a short interval. In his original (very short!) description (in separate Dutch and French versions), Stoll himself said that the specimen (with other material) came from the Coromandel Coast (of India!) which was/is within the distribution of *D. chrysippus* but not *D. petilia*! And his illustration clearly shows that the species is what we currently call *petilia*. [See translated description and accompanying figure in Annex A]

Because of very similar morphology, *D. petilia* was eventually lumped in with *D. chrysippus* as one of its subspecies. However, because of new evidence, including mitochondrial DNA sequence data, in conjunction with earlier allozyme studies, as well as structural, morphometric and pattern characters, *Danaus petilia* was reinstated as a full species in January 2005 (Lushai et al 2005). [morphometric: size & shape etc comparisons of body parts of all stages of the related insects]

Six years earlier, Zalucki (1999), in a monographic paper, summarised the known information on *D. chrysippus* and included information on its subspecies distributions as well as its behaviour, host plants preferences, population dynamics etc. He also drew attention to a much earlier study of allozymes in this *chrysippus* group by a British worker (Kitching 1984) which showed that *D. chrysippus petilia* could have

been given full species status! He noted that the finding did not seem to have been followed up, which then led to this further, more definitive, molecular work. [Allozymes: Enzymes (proteins) which are variations because of the way they are coded on the allele gene loci. Protein electrophoresis is used to identify and compare them]

The holotype, which was part of a private collection, has never been found. [see Annex A] In my opinion the holotype could only have come from a Dutch colony in the East Indies and only from somewhere in the butterfly's natural distribution. This was most likely from Dutch [West] New Guinea where the centre of administration was Hollandia (now Jayapura) on the Vogelkopf Peninsula. In any case (and fortunately) the original painting appears more like our *D. petilia* than other forms of *D. chrysippus*! Possibly on the basis of this image, Lushai et al (2005) assumed the specimen was a *petilia* and erected a neotype from a fresh Australian specimen.

The two species are usually separated to either side of Lydekker's Line, which is the artificial boundary between Australia / New Guinea's continental shelf and the rest of the Indonesian Archipelago. *D. petilia* is confined to the eastern side (Lushai et al 2005). Three subspecies of its congener, *D. chrysippus*, occur on the western side of this boundary and vagrants occasionally reach Australian shores [see distribution maps in Zaluki, 1999 and Lushai et al, 2005]. In recent years, small populations of the *chrysippus* subspecies *D. c. cratippus* have been found to be flying (but not interbreeding) with *D. petilia* in melaleuca forest on the Cobourg Peninsula near Darwin (Braby et al 2015). The taxon *cratippus* has also been seen in small numbers on Thursday Island in the Torres Strait (Braby, 2016).

As these allopatric species are interfertile they are capable of hybridising, although this has not been seen and Lushai et al (2005) further pointed out that their close separation has existed for an estimated 1.1 million years. Braby et al (2015) explained this apparent anomaly using molecular evidence gained from looking at mitochondrial and nuclear genes. These show that "*D. petilia* and *D. chrysippus* are reciprocally monophyletic, which suggests that the two 'sister' species maintain their distinctiveness even when given the spatiotemporal opportunity for interbreeding". [monophyletic: coming from a single genetic line – although further back in time these must have diverged from a common ancestor]

Because of these mutually supportive studies Braby (2016) has included both species in his second edition Australian butterfly field guide.

Larval food plants = Host plants

For a butterfly with such a wide distribution (virtually the whole of mainland Australia) it has relatively few native host plants (eight or nine compared to about 35 for another danaid, the Common Crow butterfly, *Euploea core*) and these are all in the family Asclepiadaceae, now considered part of Apocynaceae. According to Braby

(2000) the main coastal host species is *Cynanchum carnosum* (historically *Ichnostemma carnosum*) known as Mangrove Wax-flower Vine in southern Qld and Mangrove Milk Vine elsewhere. This is also the main host for another closely related danaid, the Swamp Tiger, *Danaus affinis*. In inland and semi-arid locations, its main host is *Marsdenia australis* (syn. *Marsdenia leichhardtiana, Leichhardtia australis*) but it also utilises *Rhyncharrhena linearis* in southern central Queensland and central NSW, *Cynanchum floribundum* in South Australia's Flinders Ranges and *Sarcostemma esculentum* in the Kununurra district of Western Australia. According to Forster (1991a) it uses *Brachystelma glabriflorum* throughout the northern tropics as well as *Cynanchum christineae* and *C. liebiana* only in the "Top End" of the Northern Territory.

Zalucki (1999) also listed two native *Pentatrophis* species but these are both synonyms of *Rhyncharrhena* (which is listed beneath them!) and both he and Braby (2000) mentioned another exotic group (two species of *Calotropis*) both of which I am unfamiliar with although, according to the Queensland Herbarium plant census, the latter two species are tropical in distribution. They are valid records of northern Queensland hostplant guru Garry Sankowsky.

The record of *D. petilia* utilising *Tylophora* species in the 3rd ed (2010) of BOIC's "Butterfly Host Plants of South-east Qld and northern NSW" may be incorrect, as the dual listing included the Common Crow butterfly for which the plant is a valid host [as per Paul Forster's *E. core* record on a cultivated "*Tylophora* species" (ex-Herberton area) at St Lucia (Forster 1991b)].

It was included for *D. petilia* (without details) in Braby 2016 but this may have been a reflection of the BOIC listing, which for space reasons could not credit many of the early records. I have since been unable to ascertain who provided the observation for *D. petilia* utilising *T. barbata*. In fact I can find no reference for *T. barbata* in the "butterfly" literature and although it is not listed in the Queensland Plant Census, Harden et al (2007) include it in their book of rainforest climbing plants, and state its distribution as "from Lakes Entrance (East Gippsland) [Victoria] to [the] Nundle district [NSW]". Unless confirmed, the *Tylophora* listing (for *D. petilia*) will be excluded from any updated/revised edition.

Since the introduction of exotic milkweeds the butterfly has prospered. In coastal and subcoastal Queensland for example, *Danaus petilia* competes with the exotic Monarch (*Danaus plexippus*) for three exotics, namely Balloon Cotton Bush (*Gomphocarpus* = *Asclepias physocarpus*) and its look-a-like *G. fruticosus* in NSW, as well as the attractive red, yellow or red and yellow flowering *Asclepias curassavica.* The colourful larvae feed openly on all these plants, possibly depending on their bright colours being an aposematic warning for predators that they might be toxic. This leads us into another topic where possibly poisonous adults gain protection

from displaying gaudy colours and other look-a-like butterflies also gain protection as mimics. [This subject will be covered in part 2 of the *D. chrysippus/D. petilia* story]

Female *Danaus petilia*
Photo Russel Denton

Female *Danaus petilia* underside
Photo Kelvyn Dunn

Larva of *Danaus petilia*
Photo Ross Kendall

Pre emergent pupa
Photo Hong Ming Kan

Acknowledgements:
Ross Kendall, Hong Ming Kan, Kelvyn Dunn and Russel Denton for photos
Peter Hendry was most helpful in locating two-century-old-plus references!
Kelvyn Dunn made useful suggestions to improve the manuscript.

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Annex A

Papilio petilia Stoll, C. *in* Cramer, P. 1790. *Uitlandsche Kapellen.* [Dutch title] or *Papilions exotiques des trois parties du monde l'Asie, l'Afrique et l'Amérique.* [French title]. Supplement. Amsterdam Baalde and Utrecht : Wild Pt (2) pp. 43–162 pls 9–26; Suppl. (3) p. 1. 43-162 pls 9-26 [dated 1775–1790] [Page 132 pl. 28 fig. 3].

Caspar Stoll's 1790 description of the taxon *petilia*:
[note: Early entomological descriptions usually had very little detail and relied on an artist's drawing or painting to convey the description. In this case just a few words about the species underside!]

"This [previously] unnamed nymph belongs with these following species (which have already been represented in the great work of Mr. Cramer), all denominations of Menalippus, Plexippus & Chrysippus." "The underside is very distinct, little [to say] of the top [=forewings] while the veins of the lower wings [=hindwings] are more visible & more black".

"I have often received this species from Samarang, on the northern coast of Java, & China, but this one is from the Coromandel Coast" [India].
"It is located in aforementioned cabinet" [of Mr Raya Breukelerwaerth – apparently a small private collection]

Life history notes on the Lesser Wanderer, *Danaus petilia* (Stoll, 1790) Lepidoptera: Nymphalidae – *Wesley Jenkinson*

This very common butterfly is known from across most of the Australian mainland including the arid inland areas and western Tasmania (Braby 2000). The adults are known migrants and frequent most habitats from rainforest margins to wide open woodlands and grasslands.

The adults fly within a few meters of the ground but may fly much higher when in search of nectar. They have a rather slow flight, but are capable of fast speeds when disturbed. Flight occurs in both sunny and warm cloudy conditions.

Both sexes are readily attracted to a wide range of small native and exotic flowers and can also be observed imbibing moisture from the ground (mud puddling) during hot weather. Adults are rather fond of imbibing chemicals from damaged Blue Heliotrope (*Heliotropium amplexicaule*) leaves and flowers particularly in freshly mown lawns. The wings are slowly opened and closed while feeding at flowers.

Within Queensland, individual specimens show variation in physical size and slight variation in the size and shape of the white spots on upperside and underside of the wings. To determine the sexes, males have a clearly visible small patch of dull grey scales on the upperside of the hindwing and a corresponding black circle with a white centre on the hindwing underside.

Wingspans for the pictured adult specimens are both 60mm for the male and female.

Danaus petilia (Lesser Wanderer) left to right: male, female

Danaus petilia (Lesser Wanderer) left to right: male underside, female underside

Ovipositing females flutter slowly around the host plants and generally settle with wings closed. The eggs are laid singly, chiefly on the underside of fresh or older leaves and flower buds. Females will oviposit within centimetres of ground level if suitable host plants are available.

In January 2007, an egg was collected from near Beaudesert and raised through to an adult on an exotic milkweed, the Balloon Cotton Bush (*Gomphocarpus physocarpus*).

Egg

This egg was barrel shaped, approximately 0.9 mm wide x 1.2 mm high, with 21 coarse vertical ribs with very fine horizontal lines, white when laid changing to pale yellow after 2 days.

In captivity the 1st instar larva consumed the eggshell soon after hatching and later fed chewing small patches into the host leaf. As the larva grew, it fed from the edges of the leaves and was observed feeding during daylight hours. It completed five instars and attained a length of 38mm.

1st instar larva

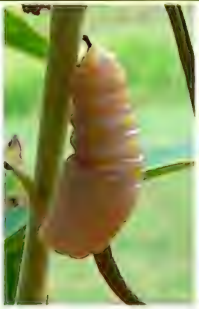
2nd instar larva

3rd instar larva

Above 4th instar larva

Right 5th instar larva

Pre pupa



Pupa

Pupa pre emergence

Green form pupa Pale caramel form pupa

A pale caramel coloured pupa, measuring 20mm in length, was located below a stem of the host plant. It was attached with silk hanging by the cremaster with the head suspended down. Occasionally the pupae can be a pale caramel colour but are usually green.

Under natural conditions the larvae often leave the host plant and pupate below a nearby grass stem or below a leaf on a nearby shrub and are often heavily parasitised by Tachinid flies and small wasps.

The total time (during summer) from egg to adult was over 3 weeks, with egg duration 5 days, larval duration 11 days while pupal duration was 8 days.

Within the new boundary of the Scenic Rim Regional Shire south of Brisbane, I have records of adults from all months of the year, being less numerous in the winter months. There are most likely several generations per year in this region.

I would like to thank John Moss for commenting on the manuscript.

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Photos Wesley Jenkinson

ITEMS OF INTEREST

Mistletoe Profile – extract from **The Mistletoes of Sub-tropical Queensland, New South Wales and Victoria** by *John T. Moss* and *Ross Kendall*

Bronze or Box Mistletoe (*Amyema miquelii*)

Description

The long leaves of this pendulous mistletoe often have a bronze/orange hue especially in strong sunlight. Leaves are up to 25 cm long and 3 cm wide. They are opposite, usually falcate and somewhat resemble those of the host tree.

This mistletoe has umbels of attractive crimson flowers with pink petals and red stamens in multiple triads and occasionally tetrads. The umbel of flowers is usually composed of 3 to 7 rays from each peduncle with all flowers of the triads pedicellated as well as the lateral ones of the tetrads (the central two being sessile). Rarely, the central flower of a triad is sessile, when compared with flowers of *Amyema pendula* where this is always the case.

The fruit (yellowish when ripe) are smooth, barrel shaped and with a rounded bract. They are 10mm long and crowned with a persistent style, compared with *Amyema pendula* where the style is discarded. All fruit are of the same age compared to those of *Amyema pendula* where they are often of different ages.

Habitat and Host Plants

This common and very widespread mistletoe is found on smooth and stringy-barked eucalypts especially Forest Red Gum (*Eucalyptus tereticornis*), Ironbarks (especially *Eucalyptus crebra*), Poplar Box (*Eucalyptus populnea*) and occasionally on acacias, in open forest and woodland.

Butterflies and Moths

- Spotted Jezebel or Wood White (*Delias aganippe*)
- Scarlet or Northern Jezebel (*Delias argenthona*)
- Imperial Jezebel (*Delias harpalyce*)
- Black or Common Jezebel (*Delias nigrina*)
- Trident Pencilled-Blue (*Candalides margarita*)

- Marbled Line-blue (*Erysichton palmyra*)
- Diggles' Blue or Silky Jewel (*Hypochrysops digglesii*)
- Cyane Jewel (*Hypochrysops cyane*)
- Sapphire or Cooktown Azure (*Ogyris aenone*)
- Satin Azure (*Ogyris amaryllis*)
- Golden or Sydney Azure (*Ogyris ianthis*)
- Broad-margined or Dull Purple Azure (*Ogyris olane*)
- Silky Azure (*Ogyris oroetes*)
- Southern and Northern Purple Azures (*Ogyris genoveva*, *Ogyris zosine*)
- Mistletoe Day Moth (*Comocrus behri*)
- Mistletoe Emperor Moth (*Opodiphthera loranthi*)

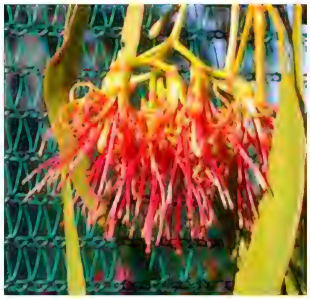
Notes

This mistletoe appears to be the most utilized species with 15 butterflies and two moths recorded to date. One of the more interesting ones was the observation by John of a female of the rare Marbled Line-blue ovipositing on the haustorium of the mistletoe. The host tree was a large stringybark eucalypt in the Bolivia Hill Nature Reserve, 35 km south of Tenterfield, alongside the New England Highway.

Amyema miquelii foliage

Amyema miquelii foliage and flowers

Amyema miquelii buds



Amyema miquelii flowers

Amyema miquelii fruit

Photos Ross Kendall

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An odd Lasiocampidae (Lepidoptera : Lasiocampidae) –

Peter Hendry

On a recent field trip with Wes Jenkinson to the Tablelands west of Rockhampton (October/November 2017), I had the good fortune to collect a species of Lasiocampidae that at first baffled me. While believing it belonged to the Lasiocampidae I started doubting myself when I found nothing that compared to it. Eventually, in Moths of Victoria Part 2, I found an image that is almost a perfect match. The species is unnamed and listed as *Lasiocampid* sp. (1), it is sexually dimorphic and a note on the female, which mine is, reads; the female has been included with *Symphyta* but the male is clearly not in this genus. The male illustrated in Moths of Victoria was collected from Armidale NSW, in 1949 while the female was from the Grampians Vic the collection date is obscured on the label but believed to be in the 1940s. Though a bit larger (46mm as opposed to 38mm) than the species illustrated I decided to contact the author of Moths of Victoria Part 2, Peter Marriott; he kindly replied with the following:

"That certainly looks like it. Since our initial publication, we have had more turning up and the distribution now extends in a broad band, north of the divide but including the Grampians from the SA border to virtually Albury in the northeast. Steve Williams gets them sporadically at his place at Eppalock outside Bendigo. We've gone from 3 known from Vic to 12 at the last count.

So your record shows it pushing right into Queensland; the ANIC material is up to central NSW. Interesting and rarely seen I'd say."

Photo Peter Hendry

One of the joys of mothing is that you never know what will turn up next.

Butterfly Pests! – *Bernie Franzmann*

I was talking to a friend the other day and was telling him that there are few butterfly pests in Australia – in the world for that matter – but there are a lot of moth pests.

He asked why and I said I didn't know. He said, "Maybe it's because they sneak around at night and so are up to no good, whereas butterflies are about in the day." I don't think that is a logical explanation, so I thought I would do a bit of research.

Cabbage White butterfly
Photo Kleiner Kohlwessling
https://commons.wikimedia.org/wiki/Category:Images

I could only think of three butterfly pests of crops: the Cabbage White butterfly and the two citrus butterflies - Orchard Swallowtail and the Dingy Swallowtail. These citrus butterflies are extremely minor pests. I dug a little further and found five other very minor butterfly pests - Common Grass-blue, Pea Blue, Pale Pea Blue, Rice Skipper and the bean-flower caterpillar and. So the only butterfly of major concern is the Cabbage White.

However, I found about 90 moth pests. Some of these you may have heard of: cutworms, armyworms, bollworms. Even when there are butterfly pests, moths in the same crops are more troublesome.

For example, in Cruciferous crops (cabbages, cauliflower, broccoli, etc.) and in canola, the Cabbage moth is a bigger pest than the Cabbage White butterfly.

In citrus, the fruit-piercing moths and leafminers are more important than the butterflies.

In cotton, a very important crop for Australia, there are no butterfly pests but 13 moth pests. Two of these moths are such a serious threat, that if not controlled, no cotton would be produced.

There is at least one good moth in Australia, *Cactoblastis cactorum*, which, after being imported from Argentina, virtually wiped out 24 000 000 hectares of prickly pear from 1927-1933, and still keeps it under control.

Fruit-piercing moth (*Eudocima aurantia*)
Photo Graeme Cocks http://kooka.info/index.html and lepidoptera.butterflyhouse.com.au/calp/aurantia.html

There are about 400 butterflies in Australia and moth numbers are estimated to be about 22 000. Therefore numbers of moths are 50 times more than butterflies. So if there are, say, two butterfly pests and the proportion between numbers of species and number of pests hold for moths and butterflies then there should be 100 moth pests. That may be the answer.

So there you have it, butterflies are overwhelmingly good and moths are OK also - another reason to like butterflies and moths and join the BOIC.

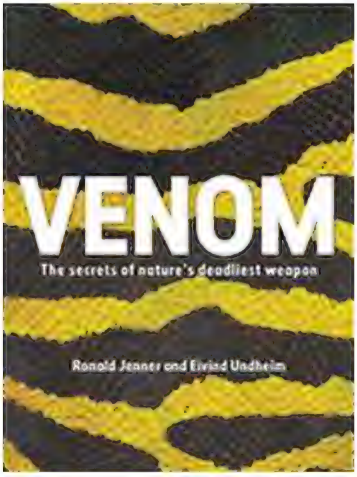
UNDER THE MICROSCOPE

Are you able to identify this image?

See page 31 for the answer

Photo Trevor Lambkin

BOOK REVIEW



Venom – The secrets of nature's deadliest weapon **Ronald Jenner & Eivind Undheim** CSIRO Publishing 2017. Paperback 208pp; ISBN: 978-1-486-30837-8. AUS $29.95

Reviewed by *Kelvyn Dunn*

"*Where's that boy gone with my snake!*" the late Stan Stirling – a naturalist residing in Kuranda – exclaimed to my father back in 1976; his pet had just been conscripted into a butterfly tour of duty! Fear can be inextricably linked with fascination and because of that, it often conduces a desire to investigate. But not all of us experience concern when confronted by dangerous animals or creatures that give that impression. I once collided with a Giant Water Bug as I exited a department store in the Townsville Mall – its feigned aggression left many shoppers looking aghast. The reactions of some, however, soon changed to fear after I eagerly seized it and held it up for a closer look. The Toe-bitter is no doubt a fearsome enemy to a goldfish into which it injects paralysing and liquefying toxins so that it may suck

up its meal, but to me, this was the biggest water bug I'd ever seen and a delight to behold! Huge insects or anything horrid that may look like them can terrify even where no threat is present. And, some venomous creatures will still evoke anxiety even amongst the most ardent naturalists – "*Many of us have irrational fears of one kind or another*", the text declares. One of the authors of *Venom* candidly admits to loathing at just the thought of "a large flying insect" becoming entangled in his hair! I could only guess then that a fearsome-looking Toe-biter crash-landing onto his head – as if it were a tarmac of waterweeds – might have raised a shriek of terror amongst some of the onlookers in the mall that day, beyond inducing "shivers of revulsion" that that author of *Venom* fears he might experience. "Snakes or spiders, however, don't trouble him at all", the text adds (p.156) – and that is intriguing! Draped in Stan Stirling's swamp python – as one might sport a footy scarf at an MCG Grand Final – I scampered off to look for hamadryad butterflies in the deeper recesses of his rainforest-garden. With his snake recovered post-haste (and tucked away out of my sight for its own security), Stan's disquieting expression lingering on over his near loss suggested that he now perceived that this child was one of 'a different nature', as a teacher had once penned of me. After flipping through *Venom* and glancing at the poised rattlesnake and that equally threatening funnel-web spider, I wondered whether those of that 'other nature' might shuffle this book 'out of sight' on an upper library shelf. There it might stay 'out of mind' of all readers prone to night terrors, limiting its access to those who are indifferent to such raw content, as the naturalist most likely will be!

An intrinsic anxiety of snakes suffered by many people has not arisen from cult classic films like *Anaconda* and its horror sequels (as some social commentators of the 'nature-nurture' debate might suppose) but stems from a prehistory largely forgotten in our psyche. Snakes have been associated "with a number of gods, both good and evil", as the book tells. Many will recall the legend of a famed garden of antiquity wherein a naked young woman was enticed by a crafty serpent. Perhaps, by offering a natural history slant, I can embellish that account a little by suggesting that a tree viper was dangling amongst those heavily laden branches stealthily in wait of fructivorous animals – rodents, birds, fruit bats and the like. In my mind too, it was probably a strikingly beautiful reptile (and, arguably, some snakes can be so described, the text concedes on page 28) into whose territory she had reached, unthinkingly, for those delectable fruits which 'looked so good'. The seeding of that innate fear of the serpent happened so long ago that some of us have lost much of that ancient concern that arose through our company with these venomous and sometimes very dangerous creatures. Charles Darwin wrote in his work, *The Descent of Man* of how monkeys are instinctively fearful of snakes – or even a stuffed one for that matter! Darwin hid a live snake in a paper bag and left it in a cage with several monkeys at the Zoological Gardens (presumably London) to see what would happen. Each monkey would take turns having a peek into the bag and upon seeing the snake, would flee! The authors of *Venom* draw on this 19th century scientist's

'mischievousness' (a description I have capriciously applied from the primate's perspective), remarking on how those monkeys "*were irresistibly pulled towards the source of their fear, repeatedly overcoming their horror to satisfy their curiosity*" (p.157). Those who remain innately anxious of snakes (almost 35% of subjects in a sample from the Netherlands – women ranking 10% above and men 10% below), a few of whom may be irrationally phobic, and yet who do not encounter these reptiles in their daily working lives perhaps rank as vestigial among our modern population. Indeed, the book reports too that up to 3% of the general population in developed countries suffer from snake phobia, that inappropriate emotional response that logic cannot quash.

The introduction explains the structure of the book and the diversity of the weapon itself, whether it is venom, poison, or a toxin, and clarifies the confusion over the definition of what is venomous and what is poisonous. It distinguishes venom as a secretion delivered from one animal to another usually by inflicting a wound, to disable the prey or deter the intruder. The text discusses how scientists extract venoms, details their extraordinary diversity, which ranges from the complex cocktails that spiders produce to the simple formic acid mixtures that ants make, and describes the lethal power for which many types of venom are renowned. Some illustrations of catastrophic tissue necrosis resulting from the toxins delivered by a Pit Viper or Spitting Cobra may alarm the faint-hearted. The chapter on the evolution of venom discusses the paradox of how even closely related species may have different venom cocktails whilst some distantly related groups produce similar venoms. Another chapter outlines the varied usage of venom in human cultures and rituals, including the veneration of venomous animals in religions, and describes bizarre rites of passage that may involve torturous bites from hordes of ants. The use of venom for cures of illnesses, its misuse in medical quackery, and its applications in the cosmetic industry are all covered. An inventory of drugs derived from venom proteins, the medical conditions they treat, and the species whose secretions have enabled those advances in medicine is a handy accompaniment. Of these, the reptilian venom purified from the Gila monster (a species inhabiting the southern USA and Mexico) has sourced two drugs for the treatment of Type II diabetes in just the last decade. In addition, that muscle paralysis that the venoms from jellyfish, snakes and bees can produce has found value in the glamour industry, offering the user an ephemeral reduction in facial wrinkles. The final chapter examines the defensive role of venom in the honeybee and the bees' own hypodermic delivery system that an independently functioning pumping device empowers. It expands on the use of bee venom in cosmetic treatments, which began with the Ancient Egyptians; some of the modern applications, however, such as the use of crude venom in acupuncture are not without risk of anaphylaxis. A short glossary and an index that covers a range of topics and key words, then follow. A list of six books and five journal articles recommended as further reading entices the student to advance their understanding, and the picture credits and the acknowledgements then complete the work.

Venom tells a wondrous story of the incredible array of species that depend on nature's ultimate weapon for predation, defence, mating, communication, interspecific competition, reproduction, and even home building. An evolutionary tree showing the twenty lineages that contain venomous animals, with the three main functions of that toxic secretion depicted by different colours for each lineage, summarises that proliferation of venom in the animal kingdom. An accompanying table of those venomous groups points out the number of times venom has independently evolved, the number of species in each group that uses it, and the diversity of those roles that venom can serve in each lineage. Readers might be surprised to learn that venom has arisen 88 times among the ancestors of those ten groups of animals and over 40 times amongst the arthropods. Arachnids score highly on the venom-makers list – and no one would raise an eyebrow at that – but the more than three-fold increase seen in the insects is astonishing. Worldwide 151,845 species of insects are venomous; the bulk of these are hymenopterans (100,000 species of ants, bees and wasps) which use it for defence, parasitoidism and predation, and the dipterans and heteropterans (30,624 species of flies and 10,370 species of bugs, respectively) which use it for blood feeding and predation. Lice, fleas, lacewings and moths contain a share of venom makers too. The single venomous beetle known to science presents as an oddity, however. The Longhorn Beetle is equipped with sharp spines at the tip of its antennae that deliver defensive venom using an apparatus that is astonishingly like the stinger of scorpions; those electron micrographs give a visual insight into this remarkable example of convergence. As the blurb enlightens the dabbling reader, the diversity of toxin usage amongst 15% of the animal kingdom – which includes over 226,000 known venomous species (with many others still awaiting discovery) – ranges "from snakes and scorpions to Gila monsters and platypuses". Atop of these are the numerous jellyfish that gracefully ride the ocean currents – all are venomous – and which include those notorious ones inhabiting Australia's northern shores whose presence may see the closure of swimming beaches in summer.

The great variety of structural and behavioural adaptations used to deliver the precious cargo – a mixture not made without effort – to prey, predators and competitors is a marvel of nature that the book highlights. These varied means of delivery include stinging, piercing, drilling, scraping, biting, pinching, head butting or spraying! And, effective evasion by the prey is something hoped for rather than guaranteed. The African Red Spotted Assassin Bug, for example, can defend itself by spraying toxin a distance of 30 cm (almost eight times its own body length) on the unwary intruder. However, only the speediest critter could out manoeuvre the Spitting Spider as it ejects its lethal mixture at 100 km per hour! And, cnidarians release their stinging harpoons (stylets) at that same speed, in just 700 nanoseconds – I can't even fathom how quick that might be! Some predatory social insects can present like a pack of ravenous wolves – they may be small but their cargo is deadly nonetheless. Maricopa Harvester Ants, one example the books discusses, produce the most potent

insect venom known, which ranks well above deadly snakes on the lethal dosage value! For many, a cowering or fleeing moment from one or a swarm might be that animal's last, as it attempts to hide from or evade that physical and chemical arsenal that has expanded among the venomous to an unimaginable scale over millennia. And weaponry is not just for predators; many herbivores can pack an unexpected punch when required but that may not assure their escape. Some species of the South American Giant Silkworm Moths might look like a tasty meal to an insectivore but the irritating hairs are capable of "inducing massive internal bleeding, destruction of blood cells, kidney failure and even death in humans". The authors clarify (p.189) that "*Virtually all venoms are cocktails of different toxins that attack numerous physiological targets, causing multiple envenomation effects that range from subtle and reversible behavioural alterations to the catastrophic destruction of bodily integrity.*" For some casualties of the wild, death is not always swift; hostage taking and suspended animation for weeks may become their unsettling fate – a concept conjuring cringing images from the 1979 blockbuster movie, *Alien* – as the victim awaits its gradual consumption by something grotesque, like the larva of the Tarantula Hawk Wasp. Some of the venomous multitudes are raging a cloak and dagger war against other creatures so differently and sometimes less powerfully endowed; cruelty is the norm, mercy is conspicuous by its absence, and that element of surprise is the tactical means to secure that meal or evade that finality.

For some animal groups, the book reveals that the roles of venom involve "much more than just kill and defend". Certain molluscs offer a would-be victim the option to flee if they take heed of their pageantry and perceive that "nasty nature in a cute package" for what it is. When that Blue-ringed Octopus flashes its warning signal, think yourself wise as you admire the electric-blue display – out of hand! There is "more than meets the eye" in that splendour! One section antithetically titled 'Love thy neighbour' reflects on the toxic power of venom where used in competition within species. That deceptively peaceful mammal, the Australian Platypus – the males of which are armed with a spur that releases similar acting toxins to Stonefish and Black Widow Spiders – slides right off scale in the 'human spectrum of the unethical'. Some scientists now suspect that this soft-furred and cute-beaked creature has a sinister side to its mating strategy. The thought of the male using its severely painful and utterly debilitating venom as a 'love potion' to ensure that the wooed female, once stabbed, will not mate with other males during that breeding season, may leave the reader feeling disturbed! If allied suspicions about egg-laying mammals stand as true too, no doubt the female echidna now breathes a sexual sigh of relief as her male cannot erect its spurs and is without venom, having potentially lost its ability to sequester toxins, and to deliver these, at some point in evolutionary time.

The many different animals dealt with as examples in the various sections would have made editing this book (to ensure that there is no repetition) an unenviable task. The mention of bee stings in six separate places in the body text, with that coverage expounding different aspects of the sting insult, offers insight into the textual

complexity the work entails. The discussions for this one example include the active delivery of the bee venom, the sting site-dependent pain intensities, the relative lethality of the venom, and the possibility for catastrophic overreaction of the immune system (a physiological response by the victim that enhances the bee's own weaponry). Moreover, these mentions of bee stings are all outside the chapter dedicated to honey bees and their chemical armoury. Careful proof reading has eliminated virtually all concerns linked to topical enmeshment with just a few typos and minor editorial mishaps having missed correction; the reiteration of the sizes of peptides relative to proteins on page 136 and, a few sentences later, on page 137 is but one. The third last sentence on page 94 repeats an experimenter's name, either as unedited detail or at the expense of a co-worker's name. A misspelling of envenomation in a header (p.42), reference to a sting to the skull (rather than scalp) (p.95), and the usage of lowercase letters in a caption (rather than uppercase for agreement with the figure components and the remainder of the lettering usage in that caption) (p.35) are nothing more than rare exceptions to an unruffled read. One or more plates may have been added after the index was computer generated; a listing of 'moths' for pages 53-54 is mistaken as page 54 has no text and is occupied by a picture of a defensively posed rattlesnake; the text dealing with Giant Silkworms continues on page 55. Checking a few indexed items that face other full-page illustrations exposed no similar concerns.

The amazing information that *Venom* contains stimulates the reader's interest and a scattering of curious anecdotes lightens the read. That crazy story, for example, of how the Brisbane Courier Mail reported in 1936 that eight hours of slapping, scolding and shaking had saved the life of an 11-year-old snakebite victim stands as an unexpected remedy from not so long ago. More worrisome, however, the book exposes that in 2010, a review of 48 websites that gave good-intentioned advice on treating snakebites found that more than half suggested dodgy remedies, including the application of ice and electric shocks to the wound. Faced with the increasing array of solutions now presented by those internet-savvy witchdoctors and other alternative practitioners, some fans of political correctness may argue that we should acknowledge these options as 'cultural equivalents' to what science has put in place of quackery. The authors politely and unashamedly admit that they are still perplexed as to how smoke blown over the wound, the application of external herbal potions, or even tantric sound waves can neutralise the deadly effects of venom. Ancient writings remind us that the 'road to destruction is a broad one', and to that belief might be added (from a biomedical perspective) that many seekers of those alternative treatments will go that way! The 'narrow path' reaping the benefits of applied pharmacology is a costly one though and some, but not all, can afford its fruit of life. The authors accept then, faced with this inequity, that hope is "*driven by the all too understandable conviction that to do something must be better than to do nothing*"! One might ponder too, whether the study of venom tells anew that ancient story of the 'tree of knowledge' in the midst of a garden of frightening toxicity, the

pharmaceutical fruit of which now beckons us to taste of it for that treatment of debilitating disease. Supportively, the antihypertensive medication from the feared venom of the Jararaca Pit Viper, for example, is something 'good' that this South American serpent has given to us, and its offering of appeasement might help balance the 'evil' that manifests following its fang impact.

I recommend this book to all who wish to learn of 'the good and evil' that ancient biochemistry has sequestered in the natural world. No doubt, reading *Venom* may invoke a sense of both curiosity and trepidation in many people but most with a biological focus will find its scholarly content informative and interesting. Many naturalists will offer this book, which exposes 'the secrets of nature's deadliest weapon', that well-deserved place in their library.

A reflective postscript: The cancerous rise in futile alternative medical advice now extends into anti-vaccination. ABC reporter, Adam Harvey announced this year on January 15th that whilst Jakarta struggles with the spread of the vaccine-preventable disease diphtheria, alternative health practitioners, including some "hard-line Muslim clerics who claim immunisations are un-Islamic" are undermining medical efforts through the spread of their "anti-vaccination propaganda". An anti-vax campaigner in Indonesia "who calls herself a Holistic Islam Health Activist" stated on televised news, that "*My medical knowledge is guided by God. Where is the other side's knowledge coming from? They are manipulated by Satan; that's the truth ... Let's bring the diphtheria patients in for cupping treatments*." Harvey reported that the eastern practice of 'cupping' is "a form of suction therapy that supposedly draws toxins out of [the] patient's body." The inference by the news presenter, however, was that *death* speaks more loudly! Although not dealing with the toxins of bacteria, Jenner and Undheims' book, *Venom* offers her an answer as to where some of the Western medicines are coming from. Understandably though, a knowledge that the 'serpent of old' and some of its reptilian relatives – a prehistoric lineage that dominated during the Mesozoic era – are offering their help today to improve our health may not be theologically comforting to her, nor to her supporters. A worldview based on dualism that attributes a diabolical serpentine source to the root of western medical knowledge (symbolised by the snake entwined Rod of Asclepius or Caduceus of Hermes from Greek Mythology adding fuel to fire) means that any immunity will be from the 'herd effect' rather than cupping interventions.

Source: http://www.abc.net.au/news/2018-01-15/islamic-anti-vaxxers-undermining-diphtheria-vaccination-campaign/9325852

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Moths of Victoria Part 8 – Reviewed by *Peter Hendry*

This is the latest installment published by the Entomological Society of Victoria attempting to illustrate all of the moth Lepidoptera of Victoria. Part 8 covers around 160 species from the superfamily Noctuoidea, which is in a state of flux at present.

Since Michael Fibiger and J. Donald Lafontaine reinstated Leach's, 1815 family Erebidae, in their 2005 paper, *A review of the higher classification of the Noctuoidea (Lepidoptera) with special reference to the Holarctic fauna*, much work has been done on the higher classification of the Noctuoidea and is still on going. To this end, the authors of Part 8, Peter Marriott, Ted Edwards, Axel Kallies, Marilyn Hewish and Stephen Williams have not placed all the members of the Erebidae family dealt with to subfamily. I personally often encounter this type of problem where to place certain species. I have decided to favor the Australian Faunal Directory which includes an on line, updated version of the 1996 Checklist of the Lepidoptera of Australia. However, confusion still reigns supreme, for example; the genus Acontia is currently listed on the boldsystems.org website as belonging to the Noctuidae family subfamily Acontiinae, the position it held in Checklist of the Lepidoptera of Australia. However, the Australian Faunal Directory places it under the Erebidae family subfamily Boletobiinae tribe Aventiini and now to my surprise Moths of Victoria Part 8 leaves it in the Noctuidae family subfamily Acontiinae. As an amateur, I find this type of difference hard to deal with. Whom do you trust?

Moths of Victoria Part 8 is the second to cover part of the Noctuoidea, it includes the families Euteliidae; Noctuidae subfamilies Acontiinae, Bagisarinae and Agaristinae; Erebidae in general with specific subfamilies Aganinae, Hypenodinae and Hypeninae. Each species is imaged by a pinned specimen clearly showing all four wings and in many cases, both male and female are imaged. The booklet is heavily illustrated with examples of live moths along with some larvae and even a cocoon.

The CD, which is included, has an additional 300 pages of information, including images of both sexes for all species dealt with, often showing the under-wing as well. There are several notes pinpointing marks and spots which help identify a specific species. To this end, several difficult genera have pages dedicated to how to separate the various species; though this needs to be used with caution if not all the Australian species are dealt with. Another fascinating feature is the inclusion of three original

descriptions superimposed with alfa characters which refer to part of the description. This is then pointed out on an image of the species; a great help in understanding statements like "a subterminal line of fuscous dots ending in a short subapical oblique streak".

All in all a great addition to the series and a must for anyone interested in identifying Australian moths or even a passing interest in Lepidoptera. Though centered in Victoria many of the moths dealt with occur far beyond its borders. This was driven home to Wes Jenkinson and myself when trying to identify moths, collected from a recent trip, from west of Rockhampton. Many parts of the Moths of Victoria were referred to, this one in particular.

Copies can be obtained from the Entomological Society of Victoria an order form is available at http://entsocvic.org.au/?page_id=52

IN THE GARDEN

In the garden with *Peter Hendry*

It has been many years since I have found the Joseph's Coat Moth (*Agarista agricola* (Donovan, 1805)) larvae in the garden, all be it only one. It was feeding on the Slender Grape Vine (*Cayratia clematidea*), possibly its favourite host plant. Our now retired cover artist Lois Hughes published a creature feature article on the Joseph's Coat Moth in the December 2009 Issue No. 55 of Metamorphosis Australia, the cover of which featured Lois's splendid painting

Agarista agricola

of two adult moths and a larva attending a sprig of Native Grape (*Clematocissus opaca*). The painting was originally commissioned by Frank Jordan and Helen Schwencke for the back cover of their book *Create More Butterflies*. Reproduced herein is Donovan's illustration of an adult female used as part of the original description in his 1905 work *An Epitome of the Natural History of the Insects of New Holland, New Zealand, New Guinea……*

Also on the vine was a mating pair of *Oidea dorsosignata* (Clark, 1864). They also enjoy chewing on the Slender Grape Vine and are the cause of nearly all the chewings I find on my vines. Our founding member and past president, Helen Schwencke, published an article in the December 2005 Issue No. 39 of the old Butterfly & Other Invertebrates Club Newsletter wherein she described the larvae as "cream-yellow with brownish speckle, short and stubby, with 6 front legs". Always one for the history of who named our little critters, I was surprised to find in Clark's original description the name was *Adorium dorsosignatum*. When you find the name of the author in brackets after the species name it points to the fact that genus under which it is now known is different to the one in which it was named.

It took little research to find that *Adorium* Fabricius, 1801 was a synonym of Oides Weber, 1801. It was a more academic problem to solve the difference in spelling of the specific name from *dorsosignatum* to *dorsosignata*. It boils down to the fact that in Latin you have different endings for words based on whether they are singular or plural or whether they are masculine or feminine or neuter. According to our old friend Wikipedia, Oides is plural with signatum being the nominative neuter singular of signātus, while signata is the nominative neuter plural of signātus; hence we end up with *Oidea dorsosignata*.

Oidea dorsosignata

This sort of thing has led to long-running arguments where authorities could not agree on the gender of the genus and published different endings for the specific name. And I just went for a walk in the garden!

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In the garden with *Lois Hughes* and *Erica Siegel*

A Tree of Life

In the Garden of Eden, the trees planted there were described as pleasant to the sight, good and desired for food; the tree of Life also in the centre of the garden …

Many years ago, I bought a number of plants from a roadside stall and amongst them was a plant simply labelled "Viburnum". It was in a tiny 2 inch tube and from memory, I believe it only cost $1.00.

I had visions of it growing into a shrub with large heads of showy white flowers as I'd seen in gardening magazines! It has, however, matured into a densely foliaged tree bearing heads of small white blossoms during summer.

The season before last the tree was a mass of flowers and indeed it was pleasant to the sight and very desirable for food to a myriad of insects … a life-sustaining tree.

Erica captured bugs, beetles, bees, butterflies and other creatures, over 30 in fact, and was delighted to discover some native bees she hadn't seen before. Of the many insects she photographed, not all have had their identity verified. Maybe you might be able to help with that.

We present this photo gallery of a selection of these creatures for your enjoyment.

Photos Erica Siegel

REPORTS

A visit to Japan – *Ross Kendall*

Before visiting Japan in November last year, I was invited to speak at the November 19th meeting of the Butterfly Science Society of Japan (BSSJ). I accepted the invitation and attended the meeting which was held in Tokyo.

On November 1st, 2014 the BSSJ was formed by changing its former name, The Butterfly Society of Japan that had been founded in 1993. The organization was established by and for butterfly lovers with the aims of full enjoyment of butterflies, contribution to science, preservation of nature and conservation of biodiversity. Their journal "Butterfly Science" is published at least three times a year and a contact paper "Butterfly Science Newsletter" at least four times a year.

I spoke about the Butterfly & Other Invertebrates Club and our activities and presented one of our presented one of our life cycle posters and a copy of the latest edition of "Metamorphosis Australia" to their President, Dr. Tateo Ito. My talk was well received and in the ensuing question period one question stood out. The questioner explained that there is concern among their mainly "elderly" membership and about the fact that few young people express an interest in butterflies. He then asked if we have a similar problem here. I agreed that we did and said that the Butterfly Club was currently exploring ways to attract the interest of the younger generations.

I had taken ten copies of our mistletoe book with me and these were all sold by the society within three minutes during a break between speakers!

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Aquatic bug demo at the Toohey Forest Environmental Education Centre – *Alisha Steward*

On Saturday 10th February 2018 the BOIC club meeting was held at the magnificent Toohey Forest Environmental Education Centre, nestled within the bushy Nathan Campus of Griffith University. The centre itself is worth the trip, as it is home to a vast collection of local specimens (invertebrates, mammals, etc.), as well as live displays of lizards, snakes, turtles, fish and stick insects. There are also numerous hands-on displays, books, posters, and informative touch screens.

After the meeting, myself (Alisha Steward) along with Darren Shepherd from the Education Centre ran an aquatic invertebrate demonstration. Water samples containing live invertebrates were set up at twelve stereo-microscope stations. The samples were collected from local freshwater sites: Rocky Waterholes Creek, Bulimba Creek, South Pine River and a pond in Les Atkinson Park. Before jumping straight in for a look though, I gave a background to my work as a freshwater scientist with the State Government, and a brief introduction into why we collect aquatic invertebrates and how they are used for assessing river health.

Then it was time to play! We used spoons and pipettes to capture the often fast-moving aquatic invertebrates from the sample trays and then popped them under the microscopes into petri dishes or ice cube trays for a closer look. Of the aquatic insects, we saw nymphs of dragonflies and damselflies, mayfly and caddisfly larvae, diving beetles, water boatmen, and small water striders. We also saw prawns, seed shrimps, mites, and snails. In addition to the invertebrates, the sample from the most urbanised creek, Rocky Waterholes, contained cane toad tadpoles and exotic fish (swordtails and platies). It was interesting to see how samples from the different sites varied. One of the microscopes was connected by a live-feed to a large screen, which made it easy for everyone to observe the particular invertebrates that we were talking about.

Midday approached too soon and it was time to pack up. My three year old son Stanley thoroughly enjoyed the experience and it was difficult to drag him away from the sample trays! Aquatic invertebrates certainly proved to be of interest for young and old!

Photos Alisha Steward and Ross Kendall

Bugs on the big screen - Damselfly nymph on the left and dragonfly nymph on the right

Many thanks to several people for making this day possible: to Darren Shepherd for hosting us at the centre, for setting up the equipment and for providing one of the samples, to Bernie Franzmann for providing the sample from the South Pine River, and for Dawn Franzmann and Ross Kendall for helping to organise the day.

Aquatic invertebrates spotted in samples:

Epiprocta (dragonflies); Zygoptera (damselflies); Ephemeroptera (mayflies): Baetidae, Leptophlebiidae; Trichoptera (caddisflies): Leptoceridae, Helicopsychidae Coleoptera (beetles): Dyticidae (diving beetles); Hemiptera (true bugs): Corixidae (water boatmen), Veliidae (small water striders); Palaemonidae (prawns); Ostracoda (seed shrimps); Gastropoda (snails): Planorbidae, Thiaridae; Acarina (mites)

UNDER THE MICROSCOPE

And the answer is ….. the leg of the Feather-legged Assassin Bug, *Ptilocnemus lemur*

Thank you Trevor

BUTTERFLY AND OTHER INVERTEBRATES CLUB PROGRAMME

Annual General Meeting

When: Saturday 14th April starting at 10 am

Following the AGM Dr. Christine Lambkin, Curator of Entomology at the Queensland Museum, will give a presentation titled 'QM Entomology – past, present, and future'

Where: Redlands IndigiScapes Centre, 17 Runnymede Road, Capalaba

Morning tea will be provided.

Copies of books etc. from our supply will be available for purchase, thereby saving the cost of postage.

If you wish to partake of a luncheon at the Centre's Café following the meeting, you will need to book by phoning 3824 8611.

Planning and General Meeting

What: Our quarterly planning meetings are informative and interesting and we welcome members to contribute to discussion. After the meeting, Dr. Tim Heard will speak on "Australia's stingless bees, flagships for insect popularisation"

When: Saturday 12th May 2018 10 am

Where: Karawatha Forest Discovery Centre, 149 Acacia Rd, Karawatha QLD

What to bring: Enthusiasm is welcome**.** Morning tea will be provided.

If attending, please respond to Dawn Franzmann (ph 3325 3573; 0419 786 369 email berndawn@gmail.com

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DISCLAIMER

The magazine seeks to be as scientifically accurate as possible but the views, opinions, and observations expressed are those of the authors. The magazine is a platform for people, both amateur and professional, to express their views and observations about invertebrates. These are not necessarily those of the BOIC. The manuscripts are submitted for comment to entomologists or people working in the area of the topic being discussed. If inaccuracies have inadvertently occurred and are brought to our attention we will seek to correct them in future editions. The Editor reserves the right to refuse to print any matter which is unsuitable, inappropriate or objectionable and to make nomenclature changes as appropriate.

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Producing this magazine is done with the efforts of:

- Those members who have sent in letters and articles
- Michael Hutchison who provided the cover painting
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- Kelvyn Dunn, John Moss and Ross Kendall for scientific referencing and proof-reading of various articles in this issue of the magazine

ARE YOU A MEMBER?

Please check your mailing label for the date your membership is due for renewal. If your membership is due, please renew as soon as possible. **Annual membership fees are $30.00 for individuals, schools, and organizations**. If you wish to pay electronically, the following information will assist you: BSB: **484-799**, Account No: **001227191**, Account name: **BOIC**, Bank: **Suncorp**, Reference: your membership number and surname e.g. **234 Roberts.**

Butterfly and Other Invertebrates Club Inc.
PO Box 2113
RUNCORN Q. 4113

Next Club event: Annual General Meeting 14th April 2018